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Turkish support to Kyoto Protocol: A reality or just an illusion

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ABSTRACT

The long-term increase in Earth's temperature is known as the global warming or the greenhouse effect. Taking into account the fact that the ice age only involved a global temperature variation of around 4 °C, it is clear climate change is arguably one of the greatest environmental threats the world is facing today. The impacts of disruptive change leading to catastrophic events such as storms, droughts, sea level rise and floods are already being felt across the world. In this context, the signing of the Kyoto Protocol in 1997 has been argued to be a historic step in reversing the inexorable increase in the emission of the greenhouse gases. The primary achievement of the Protocol has been so-called commitment of countries referred in the Annex I of the Protocol to reduce their emission of GHGs some 5% below their country specific 1990 level. On February 5, 2009, Turkish Parliament ratified an agreement to sign the Kyoto Protocol after intense pressure from both the European Union and international environmental organizations; however, so far it has not taken any step to bring about real reductions in emissions. In short, Turkey simply signed but ignored the Protocol. Present paper investigates Turkish position vis-à-vis Kyoto Protocol and critically questions Turkish policies in that area.

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1. Introduction

The accelerating use of fossil fuels since the Industrial Revolution and the rapid destruction of forests cause a significant increase in greenhouse gases. The increasing threat of global warming and climate change has been the major, world-wide, on-going concern especially in the last two decades. The impacts of global warming on the world economy have been assessed intensively by researchers since the 1990s. World-wide organizations, such as the United Nations, have been attempting to reduce the adverse impacts of global warming through intergovernmental and binding agreements. The Kyoto Protocol is such an agreement that was signed in 1997 after immense discussions. It is a protocol to the United Nations Framework Convention on Climate Change (UNFCCC) with the objective of reducing greenhouse gases (GHG) that cause climate change. The Kyoto Protocol identifies constraints to environmental pollutants and requires a timetable for realizations of the emission reductions for the developed countries. It demands the reduction of GHG emissions to 5.2% lower than the 1990 level during the period 2008–2012. However it is clear that future global emission reductions will require substantial efforts in future emission control by all countries, going

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far beyond the type of reduction currently applied to developed countries in the Kyoto Protocol.

The article is organized as follows. The next section provides an overview of Kyoto Protocol and its implementation so far. Section 3 presents Turkish case. The last section concludes.

2. Kyoto Protocol and the progress so far

In consequence of widespread increase in the emission of greenhouse gases some international steps have been taken. As an important first step, the UN Conference on Environment and Development was held in Rio de Janeiro in 1992 and formed the UNFCCC to protect the Earth's climate system against the effects of greenhouse gases and global warming. Under the UNFCCC, the so-called Annex I countries committed, on a voluntary basis, to limit their gaseous emissions to 1990 levels. The OECD and EU countries further joined to form the Annex II bloc and agreed to provide technical and financial assistance to those countries that remained outside the Annex I to aid their environmental policies to reduce greenhouse gas emissions. Based on voluntary participation, the specific economic and political components of such commitments of the Convention remained ambiguous. This led to culmination of efforts towards binding commitments as signed in the Kyoto Protocol in December 1997. Accordingly, the Annex I countries agreed to reduce their gaseous emissions by 5.2% relative to 1990 levels over the period 2008–2012. The Kyoto Protocol, signed in 1997 and enacted on February 16, 2005 after being ratified by the Russian Parliament, is the first agreement trying to bring constraints to emissions and requiring a timetable for realization of the reductions. The Protocol does not bring any limitations for developing countries. At present, more than 170 countries have signed the protocol.

Countries with commitments under the Kyoto Protocol to limit or reduce greenhouse gas emissions are obliged to meet their targets primarily through national measures. As an additional means of meeting these targets, the Kyoto Protocol introduced three market-based mechanisms, thereby creating what is now known as the "carbon market." The Kyoto mechanisms are:

- Emissions trading (ET),
- Joint implementation (JI),
- Clean development mechanism (CDM).

Emissions trading allows for an international trade of emissions among Annex I Parties. A party with emissions lower than its target could sell the remaining part up to the target (article 17 of the Protocol). Parties with commitments under the Kyoto Protocol (Annex B Parties) have accepted targets for limiting or reducing emissions. These targets are expressed as levels of allowed emissions, or "assigned amounts", over the 2008–2012 commitment period. Emissions trading, as set out in Article 17 of the Kyoto Protocol, allows countries that have emission units to spare – emissions permitted them but not "used" – to sell this excess capacity to countries that are over their targets. Thus, a new commodity was created in the form of emission reductions or removals. Since carbon dioxide is the principal greenhouse gas, people speak simply of trading in carbon. Carbon is now tracked and traded like any other commodity.

Joint implementation allows for any Annex I Party to be credited for emissions reduction achieved by investing in projects located in other Annex I countries (article 6 of the Protocol). Joint implementation allows a country with an emission reduction or limitation commitment under the Kyoto Protocol (Annex B Party) to earn emission-reduction units (ERUs) from an emission-reduction or emission removal project in another Annex B Party, each equivalent to 1 t of CO_2, which can be counted towards meeting its Kyoto target. Joint implementation offers parties a flexible and cost-efficient means of fulfilling a part of their Kyoto commitments, while the host party benefits from foreign investment and technology transfer.

Clean development mechanism (*CDM*) allows for any Annex I Party to be credited for emissions reduction achieved by investing in projects located in developing countries under specific conditions (article 12 of the Protocol). It allows a country with an emission-reduction or emission-limitation commitment under the Kyoto Protocol (Annex B Party) to implement an emission-reduction project in developing countries. Such projects can earn saleable certified emission reduction (CER) credits, each equivalent to 1 t of CO_2, which can be counted towards meeting Kyoto targets. The mechanism is seen by many as a trailblazer. It is the first global, environmental investment and credit scheme of its kind, providing a standardized emission offset instrument. A CDM project activity might involve, for example, a rural electrification project using solar panels or the installation of more energy-efficient boilers. The mechanism stimulates sustainable development and emission reductions, while giving industrialized countries some flexibility in how they meet their emission reduction or limitation targets.

The principal gases associated with climate change are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), which together accounted for over 99% of GHG emissions in 2005. CO_2 is the dominant greenhouse gas, accounting for 64% of global emissions in 2005, excluding land use and forestry emissions and removals. Including land use change and forestry increases the share of CO_2 in 2005 to 76% globally. Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) account for less than 1% of total global GHG emissions, but they are growing quickly. All these greenhouse gases are subject to international obligations under UNFCCC, including national monitoring and reporting of emissions and removals of greenhouse gases.

Fossil fuel combustion is by far the largest global source of CO_2 emissions, accounting for 66% of global GHG emissions in 2005. Of this, fossil fuel combustion in power generation is the most important source, and accounted for about one-quarter of all global GHG emissions in 2005. Electricity-related CO_2 emissions are also a rapidly growing source of GHGs, particularly in Asia, reflecting both increased electrification rates and the continued predominance of fossil-fired electricity.

Trends in GHG emissions vary widely according to world region. Global GHG emissions (excluding CO_2 emissions from land use change and forestry) increased by 28% between 1990 and 2005. This increase was lower in OECD countries (14%) than in BIC countries (Brazil, India, and China), where emissions grew by about 70%. Trends for OECD countries are broadly similar even if emissions from land use change and forestry are included, in which case OECD countries' emissions increased 10% over the period 1990–2005. BIC countries' emissions also increase even more (nearly 110%) if CO_2 emissions from land use change and forestry are included [6].

Fig. 1 provides shares of world greenhouse gas emissions in 2005 while Fig. 2 presents evolution of these emissions over the coming decades [7].

As can be seen in both figures, the future growth (let alone a decrease) in greenhouse gas emissions is expected to originate from developing countries in the next decades and therefore any effort to reduce the emissions should include those countries.

3. Turkish case

3.1. Climate change and Turkey

Turkey's total CO_2 emissions amounted to 304.47 million tons (Mt) in 2007. Emissions grew by 36% compared to 2000 levels and

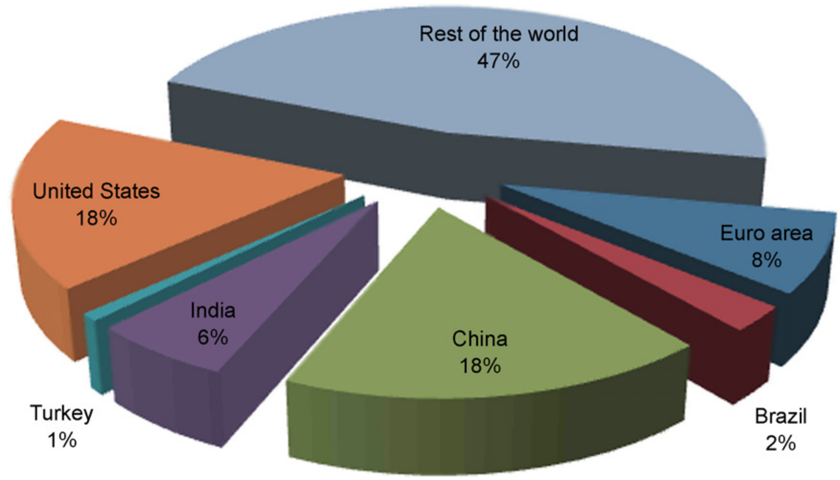


Fig. 1. Shares of world greenhouse gas emissions in 2005.

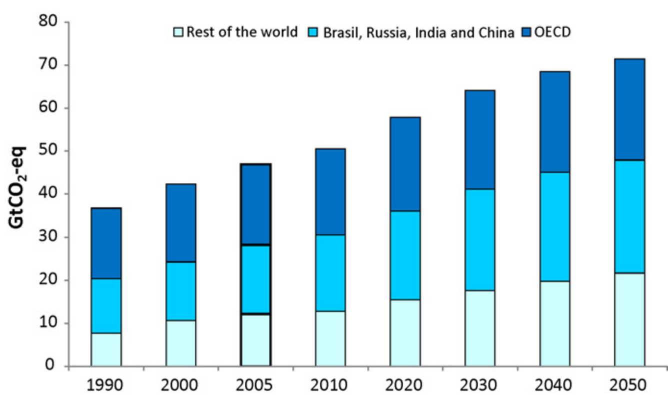


Fig. 2. GHG emissions by regions, 1990 to 2050.

by 118% compared to 1990 levels. Table 1 presents total GHG emissions in Turkey from 1990 to 2007 [9]. Oil has historically been the most important source of emissions, followed by coal and gas. Oil represented 45% of total emissions in 2004, while coal represented 40% and gas 15%. The contribution of each fuel has however changed significantly owing to the increasingly important role of gas in the country's fuel mix starting from the mid-1980s [4].

According to recent projections, TPES will almost double between 2004 and 2020, with coal accounting for an increasingly important share, rising from 24% in 2004 to 36% in 2020, principally replacing oil, which is expected to drop from 40% to 27%. Such trends will lead to a significant rise in CO_2 emissions, which are projected to reach nearly 600 Mt in 2020, about two times of 2007 levels [4].

In 2007, energy production was the single most important source of GHGs in Turkey, representing 77.4% of the total. The waste disposal was the second largest, representing 8.5% of total emissions, followed by industry and agriculture, which represented 7% each. Since 1990, emissions from energy production have fluctuated between 72% and 77%. Simultaneously, the share of emissions from industry sector was between 7% and 10%. Table 2 presents total GHG emissions in Turkey by sector from 1990 to 2007 [9].

Table 1
Total GHG emissions in Turkey (in million tons of CO_2 equivalent).

	1990	1995	2000	2005	2007
CO_2	139.59	171.85	223.81	256.43	304.47
CH_4	29.21	42.54	49.27	49.32	54.38
N_2O	1.26	6.33	5.74	3.43	9.65
F gases	0	0	1.14	3.24	4.13
Total	170.06	220.72	279.96	312.42	372.64

Table 2
Total GHG emissions in Turkey by sector (in million tons of CO_2 equivalent).

	1990	1995	2000	2005	2007
Energy	132.13	160.79	212.55	241.45	288.33
Industry	13.07	21.64	22.23	25.39	26.18
Agriculture	18.47	17.97	16.13	15.82	26.28
Waste	6.39	20.31	29.04	29.75	31.85
Total	170.06	220.72	279.96	312.42	372.64
Percentage increase since 1990	–	29.8	64.6	83.7	119.1

Per capita CO_2 emissions were at 3.3 t in 2003, much lower than the OECD average of 11.1 t and EU-25 average of 9 t. Table 3 shows GHG emission indicators for Turkey and relative parties of UNFCCC in 2003 [5]. Between 1990 and 2004, per capita emissions in Turkey grew by 22% while on average they grew by only 4% at the OECD level and dropped by 3% in the IEA Europe region. In 2005, Turkey was the 90th country with 3.4 t of CO_2 per capita emissions [10]. Historically these emissions have been much lower than the OECD average. However, owing to the important growth in emissions that took place over the 1990s, by 2004 CO_2 emissions per unit of GDP were only marginally lower than the OECD average [4].

3.2. Cost of Kyoto terms for Turkey

In their study investigating abatement costs of post-Kyoto climate regimes; Elzen et al. [3] identifies four groups of regions on the basis of similar costs (expressed as the percentage of GDP). These are:

1. regions with high income and high per capita emissions generally showing average costs when compared to other regions (Annex I regions excluding the FSU);
2. regions with medium to high per capita emissions but medium income levels and confronted with the highest costs (Middle East and Turkey, FSU, and to a lesser extend Latin America);
3. regions with low to medium income levels and per capita emissions (South-East and East Asia), and confronted with low to average costs;

Table 3
GHG emission indicators for Turkey and relative parties of UNFCCC in 2003.

	CO_2 emissions (CO_2-equiv., Tg)	CO_2 per capita (without LUCF, t)	GHG emissions (without LUCF, CO_2-equiv., Tg)	GHG emissions per capita (without LULUCF, CO_2-equiv., t)
EU-15	3,447	9.0	4180	10.9
EU-25	4,064	9.0	4925	11.0
OECD	12,780	11.1	NA	NA
Annex 1 countries	14,289	12.2	17,288	14.7
Non-EIT parties	11,633	13.4	13,855	16.0
World	24,983	4.0	NA	NA
Turkey	231	3.3	286	4.1

4. regions with low per capita emissions and a low income (Africa and South-Asia) that show net gains from emissions trading.

Fig. 3 illustrates the regional abatement costs as percentage of GDP in 2025 and 2050 based on Kyoto terms [3]. As can be seen in the figure, the regional abatement costs differ largely across the various regimes and regions. Differences between regions can partly be explained by the diversity in regional volumes traded and associated financial flows and by the differences in regional GDP. A relatively low GDP combined with high net costs can result in a higher effort rate.

Actually, signing the Kyoto Protocol does not put an additional burden on Turkey until 2012. Turkey was not a party to the convention adopted in 1992 when the Kyoto Protocol was negotiated, and it is not currently included in the agreement's Annex B, which includes 39 countries that are obliged to reduce their greenhouse emissions to 1990 levels between 2008 and 2012. However, after 2012, Turkey has to enact a series of measures in every sphere from transportation to agriculture and heating to industry to reduce carbon emissions. The government estimates the cost of making the necessary changes by that year at 58 billion Euros. Environment and Forestry Minister stated that 15 billion of the 58 billion euro investment will be made by the private sector [8].

3.3. Turkish policy so far

Turkey, being a member of the OECD, was initially listed in both Annexes I and II of the UNFCCC in 1992. Under the convention, Annex I countries have to take steps to reduce emissions and Annex II countries have to take steps to provide financial and technical assistance to developing countries. However, in comparison to other countries included in these annexes, Turkey was at a relatively early stage of industrialization and had a lower level of economic development as well as a lower means to assist developing countries. Therefore, claiming for its special circumstances, it declined to be a participant to the Convention. During the 7th Conference of Parties held in Marrakech in 2001 Turkey was granted its omission from the Annex II, and its "special circumstances" was recognized as an Annex I country with an accompanying footnote specifying that Turkey should enjoy favorable conditions considering differentiated responsibilities. Turkey has signed the UNFCCC as the 189th participant on May 24, 2004. However, Turkey did not sign the Kyoto Protocol until 2009. Turkish refusals to sign the protocol were mainly related to its expected excess implementation costs and consequently the fear of degrading her competitiveness unfairly in international trade. As a candidate country to the European Union (EU), nevertheless Turkey has strict environmental obligations to fulfill in order to quality for full membership. According to the Commission of the European Communities, the EU aims at reducing environmental pollutants 30% below the 1990 levels by 2020 [1]. Thus, Turkey has been under strong pressure from the EU to comply with the Union's regulations on environmental policy, even though pollutant emission reduction is not currently a membership criterion. Finally, on February 5, 2009, Turkish Parliament ratified an agreement to sign the Kyoto Protocol after intense pressure from

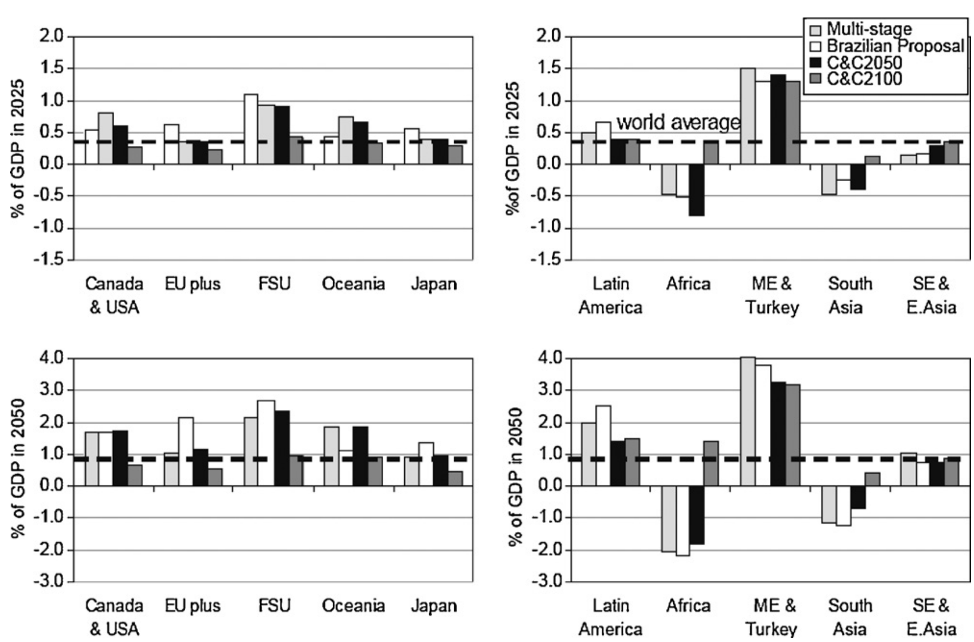


Fig. 3. The regional abatement costs as percentage of GDP in 2025 and 2050.

Table 4
Official estimates of the changes in emissions without measures (in 1000 metric tons of carbon equivalent).

Emission source	1990	1995	2000	2005	2010	2015	2020
Electricity generation	9311.72	12,952.75	21,011.43	22,379.50	31,887.03	41,538.50	60,751.51
Industry	10,291.36	11,508.09	16,423.95	20,644.06	31,661.04	40,183.72	53,867.75
Transportation	7245.33	9175.43	9933.63	11,842.94	16,487.33	21,948.30	28,093.68
Residential (other)	8872.79	9918.76	10,404.81	9182.99	13,331.83	16,624.33	18,749.79
Agriculture				2614.46	3287.80	4106.22	5103.88
Supply				460.12	1058.44	1206.72	1342.53
Total	35,721.20	43,555.04	57,773.82	67,124.06	97,713.47	125,607.78	167,909.16

Table 5
Official estimates of the changes in emissions with measures (in 1000 metric tons of carbon equivalent).

Emission source	1990	1995	2000	2005	2010	2015	2020
Electricity generation	9311.72	12,952.75	21,011.43	22,379.50	30,058.73	38,359.17	50,555.91
Industry	10,291.36	11,508.09	16,423.95	20,644.06	29,427.93	35,145.09	45,996.54
Transportation	7245.33	9175.43	9933.63	11,842.94	16,487.33	21,948.30	28,093.68
Residential (other)	8872.79	9918.76	10,404.81	9182.99	12,534.30	14,900.77	16,088.09
Agriculture				2614.46	3287.80	4106.22	5103.88
Supply				460.12	1019.09	1109.53	1168.62
Total	35,721.20	43,555.04	57,773.82	67,124.06	92,815.19	115,569.08	147,006.73

both the European Union and international environmental organizations. Three voted against as 243 lawmakers voted in favor of the protocol.

In late 2006 the European Union set, what can be called as the most ambitious goal for impeding climate change, cutting its greenhouse gas emissions by 2020 to 20% below the level of 1990. The EU further announced plans to go further and declared that it would raise its targets to 30% below the 1990 levels by 2020 to encourage the rest of the developed economies and the developing world to lake part with the Kyoto Protocol. Turkey is the only country that appears in the Annex I list of the United Nations Rio Summit and yet an official target for CO_2 emission reductions has still not been established. Thus, as part of its accession negotiations with the EU, Turkey will likely to face significant pressures to introduce its national plan on climate change along with specific emission targets and the associated abatement policies. Against this background, Turkish environmental policy is at a crossroad. As part of its bid for full membership in the EU, Turkey is under significant pressure to comply with the Kyoto Protocol, and to constrain its CO_2 emissions and other gaseous pollutants. Yet, as a newly emerging, developing market economy, Turkey has not yet achieved stability in its energy utilization and gaseous emissions either as a ratio to its GDP or in per capita terms.

Throughout this process, Turkish government carried out a number of studies on the implications of climate change and its mitigation. The first efforts were undertaken by the National Climate Coordination Group in preparation for the 1992 Rio Earth Summit. Following this, a National Climate Program was developed in the scope of the UNFCCC. In 1999, a specialized Commission on Climate Change was established by State Planning Organization in preparation of the Eighth Five-Year Development Plan (2001–2005). The Five-Year Development Plan was the first planning document to contain proposals for national policies and measures to reduce GHG emissions, and funding for climate-friendly technologies.

So far, Turkish policy to reduce GHSs has been based on energy efficiency and the development of renewable energy sources. However, the policy does not include any means that directly target GHG emissions, such as carbon taxation or emissions trading. It also does not include a specific target for emissions reductions. Briefly, the current arsenal of Turkish environmental policy instruments is mostly limited to energy taxes, environmental impact assessments, and pollution penalties. Yet, it is a clearly recognized fact that these instruments will not suffice under a more active environmental policy design and will need to be expanded to include other forms of policy measures such as additional pollution taxes, emission trading and permits, and abatement investments towards reduced energy intensities. However, given the current lack of an adequate quantitative modeling for environmental policy analysis in Turkey, the effectiveness of such policy interventions and their economic impacts are not obvious and hence there is an urgent need for the construction and utilization of policy simulation models for environmental policy analysis.

Studies carried out by Turkish government show that it may be possible to reduce peak energy demand (and thereby CO_2 emissions) by using demand side management (DSM) and energy efficiency. However, especially increasing efficiency requires some investment in the improvement of appliances and infrastructure. The estimated total cost for this investment is calculated to be approximately 100 million TL ($65 million) annually, from the year 2008 to the year 2020. Tables 4 and 5 present official estimates of the changes in emissions without and with DSM measures. Fig. 4 illustrates them [5].

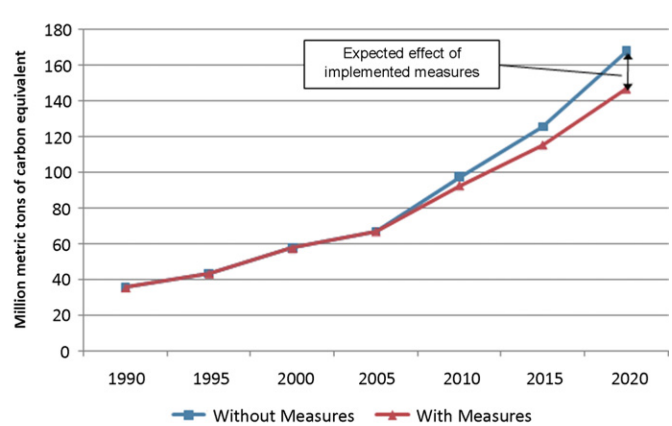


Fig. 4. National CO_2 emissions with/without measures scenarios.

4. Policy suggestions and conclusion

Turkey's share of CO_2 emissions in the world was 25th place in 2006 and its share in the total world CO_2 emissions was about 1% in the same year. In terms of per capita CO_2 emissions, Turkey's rank is 109 with 3.3 t of CO_2 per capita. So, it is obvious that Turkey is not a country with high levels of CO_2 emissions (Table 6). Its per capita CO_2 emission level is quite below the world average of 4.5 t of CO_2 per capita [11].

Turkey also has a number of features that suggests it would be possible to considerably moderate the growth of GHGs with little or even no cost. The proportion of energy derived from carbon-intensive coal and lignite is one of the highest in the world, reflecting ample reserves of lignite, while a completely liberalized market in natural gas has not existed. Most GHG emissions in Turkey come from electricity generation sector that has been a largely state-owned industry operating under non-commercial criteria. Table 7 presents ranges of GHG emissions per kWh electricity by fuel type [2]. As can be seen in the table, GHG emissions per unit of generated electricity are typically highest for industrial gas, followed by lignite, hard coal, oil, and natural gas. Hydro exhibits very low GHG emissions, in most cases two orders of magnitude lower than coal. However, hydroelectric developments may emit during operation between 5 and 20 times more GHGs, which at the higher range is comparable to emissions from fossil sources. Taking into account full energy chain contributions, GHG emissions from nuclear and wind energy (under favorable wind conditions) are in the same low range as typical for hydro. The corresponding net emissions for biomass are in the middle range (i.e., one order of magnitude lower than coal and one order of magnitude higher than nuclear and wind). So a reorganization of fuel input into energy industry may present many opportunities to reduce GHG emissions in Turkey.

Among all Annex I countries, Turkey has the highest rate of increase in GHG emissions since 1990 (119%) and is the 25th largest carbon emitting country in the world (see Table 2). Also with sharp contrast with the recent decision to ratify Kyoto, 47 new coal power plants are currently being planned or are under construction in Turkey. If these plans become a reality, Turkey's total emissions will increase by 50% in the coming few years.

Table 6
Carbon dioxide emissions by countries (2006).

Country	$MtCO_2$	Rank	% of total	Per capita CO_2 (t)	Rank
China	6,018	1	26.0	4.6	84
United States	5,903	2	25.5	19.8	13
Russia	1,704	3	7.4	12.0	26
India	1,293	4	5.6	1.2	144
Japan	1,247	5	5.4	9.8	49
Germany	858	6	3.7	10.4	42
Canada	614	7	2.6	18.8	14
United Kingdom	586	8	2.5	9.7	50
South Korea	515	9	2.2	10.5	41
Iran	471	10	2.0	7.3	67
Italy	468	11	2.0	8.0	61
South Africa	444	12	1.9	10.0	44
Mexico	436	13	1.9	4.1	95
Saudi Arabia	424	14	1.8	15.7	18
France	418	15	1.8	6.6	73
Australia	417	16	1.8	20.6	12
Brazil	377	17	1.6	2.0	125
Spain	373	18	1.6	9.2	55
Ukraine	329	19	1.4	7.1	68
Poland	303	20	1.3	7.9	64
Taiwan	300	21	1.3	13.2	24
Indonesia	280	22	1.2	1.2	143
Netherlands	260	23	1.1	15.8	17
Thailand	245	24	1.1	3.8	99
Turkey	236	25	1.0	3.3	109
Kazakhstan	213	26	0.9	14.0	22
World total	23,176		100	4.5	

$MtCO_2$: million metric tons of carbon dioxide.

Table 7
Ranges of GHG emissions per kWh electricity.

	Minimum ($kg CO_2$-equiv./kWh)	Maximum ($kg CO_2$-equiv./kWh)
Lignite	1.060	1.690
Hard coal	0.949	1.280
Oil	0.519	1.190
Industrial gas	0.S65	2.410
Natural gas	0.485	0.991
Nuclear power	0.008	0.011
Hydropower[a]	0.003	0.027
Wind power[b]	0.014	0.021
PV (mix mc and pc)[c]	0.079	–
Wood cogeneration[d]	0.092	0.156

[a] Mix of reservoirs and run-of-river plants.
[b] Calculated for average conditions of Switzerland (maximum) and Western Europe (minimum).
[c] Calculated for average Swiss conditions.
[d] 6400 kW_{th}/400 kW_e plant; allocation energy; no emission control (minimum); emission control SNRC (maximum).

An examination of Turkish policies to mitigate GHG emissions reveals that Turkish current/future strategy stands on four pillars [12]:

1. increasing the use of renewable energy,
2. decreasing the energy losses,
3. improving the fuel quality,
4. using the technology preventing the GHG.

The energy sector in Turkey is dependent on fossil resources. The share of the fossil resources in total electricity consumption was 85% in 2005. The main fossil resources are petroleum and coal. Also natural gas use clearly increased especially after 1995. Although Turkey has a significant coal potential, about 90% of this potential is low-calorie lignite. This reserve is mostly used in thermal power plants as fuel. The risk of climate change due to emissions of CO_2 from fossil fuels may be considered to be the main environmental threat from the existing energy system. Therefore, Turkey currently tries to increase the usage of renewable energy sources. For this aim, the government encourages the usage of renewable energy sources.

In order to decrease energy losses, Turkey strives for upgrading of power transmission lines, promoting the diffusion and efficiency of central heating systems, increasing the use of process energy such as co-generation systems, supporting energy-efficient technology transfer in energy field and upgrading of techniques for energy consumption in buildings.

For improving the fuel quality, scientific founding for the work regarding increase in fuel quality is promoted. Besides, Turkey tries to establish cooperation between industry and universities with regard to fuel and combustion efficiency.

Encouraging the development of techniques that increase energy efficiency and the use of high-efficiency low-emission stove and boiler systems may prevent the release of some GHG emissions. Therefore, Turkey encourages the scientific research and development of the usage of emission trappers in fuels and tries to decrease GHG emissions by technical efficiency improvements of existing power stations.

As we all know, the main source of global warming is emissions of greenhouse gasses (GHG), and the main source of GHG emissions is believed to be energy consumption. Therefore, reducing energy consumption will also decrease the emission levels. In short, at the heart of the issue is an energy system based

on fossil fuels that is mainly responsible for GHG emissions. However, it is not a simple matter of applying energy conservation methods, since energy consumption may have important effects on economic growth. Due to these presumed links between GHG, energy consumption and economic growth, it is widely believed that decreasing carbon dioxide (CO_2) emissions to the Kyoto targets would also reduce the growth of GDP. In other words, emission reduction requires energy conservation which hinders economic growth assuming that there is a causal relationship from energy consumption to CO_2 emissions and real income. Because of these presumed links, many countries (including Turkey) are hesitant to keep with Kyoto targets. However, there is abundant number of empirical studies, employing diverse methods, conducted in several countries, which point out that the link between energy consumption, income and CO_2 may not be unique. Therefore, investigating the temporal relationship between energy use, CO_2 and income in countries separately may be necessary.

It is clear that Turkey has been late in participating in the United Nations Framework Convention on Climate Change and in ratifying the Kyoto Protocol. Turkey can no longer become a "party" to the protocol so it has now "acceded" to it. Signing the Kyoto Protocol does not put an additional burden on Turkey until 2012. Turkey was not a party to the convention adopted in 1992 when the Kyoto Protocol was negotiated, and it is not currently included in the agreement's Annex B, which includes 39 countries that are obliged to reduce their greenhouse emissions to 1990 levels between 2008 and 2012. Ratification gave Turkey the right to get involved in climate change decisions after 2012. Now, Turkey has the opportunity to become a partner in the processes of constructing a global climate change regime, which it had missed in the 1990s.

The implementation of market-based reforms in Turkish electricity sector offers the possibility of significant improvements in economic efficiency and a reduction in the rate of growth of GHG emissions. Such reforms have been mooted for many years and have run into considerable barriers, not the least of which is the need for a realistic pricing strategy. Also, the recent expansion of the hard coal industry needs to be rolled-back; restrictions on the import of natural gas should be lifted through the transfer of gas import rights to potential new-competitors and the restructuring and privatization of the national gas company (i.e. BOTAS) should be completed as soon as possible. Renewable energy and nuclear energy have a role to play in GHG reduction policy too. Mini-hydro and windmills are the most promising and offer an attractive GHG mitigation. Also, cogeneration in industry and improved technical efficiency in the power sector appear to be clearly essential ingredients of future climate change policies. In the area of hydropower, the expansion of capacity needs to balance the benefits from a low-cost low-emission source of energy against possible environmental and social costs. Overall, the current thrust for market policies point towards a slowing in the growth of CO_2 emissions.

In point of fact, Turkey's accession to the protocol seems to be a part of its years-old efforts to join the EU to seek the economic and political benefits offered by EU membership. It is obvious that joining Kyoto is mainly a symbolic move for Turkey at this point, as it will have no quantified emissions requirements until 2012. What is more striking is that Turkish Ministry of the Environment has lacked sufficient authority to enforce environmental legislation and the majority of public officials are unaware of requirements in environmental protection legislation.

Up to now, the general approach of Turkey's energy policy has been highly supply-oriented, with emphasis placed on ensuring additional energy supply to meet the growing demand, while reducing GHG emissions has been a lower priority, if any. However, faced with the consequences and costs of inaction, many governments have reached a consensus internationally that global emissions need to be cut significantly. Countries are working towards an international framework for action, with the aim of reaching agreement at the UN Climate Change Conference to be held in Copenhagen in December 2009. There would most certainly be some burdens introduced by Kyoto, but benefits outweigh them. Therefore, now, the best policy for Turkey is to show the world that its move is a serious policy change (not simply a political maneuver) by reducing greenhouse emissions immediately. Besides, Turkey should start to follow a more active environmental policy and introduce new policy instruments such as additional pollution taxes, emission taxes, emission trading and permits, and abatement investments towards reduced energy intensities. Since currently it is not obvious whether Turkey will be a buyer or seller in carbon trade, no one can predict the actual cost of Kyoto terms for Turkey though cost of non-implementation of Kyoto terms is obvious. Unless Turkey starts to take some measures to reduce its GHG emissions, it will face with an extremely disadvantageous position after 2012.

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